BASF Aktiengesellschaft

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Claims as enclosed to IPER

1. A process for the continuous preparation of propylene glycols, which comprises the steps (i) to (iii):

   (i) reacting propylene with hydrogen peroxide to give a mixture comprising propylene oxide, and monopropylene glycol, dipropylene glycol and tripropylene glycol as by-products, wherein from this mixture, a mixture comprising monopropylene glycol, dipropylene glycol and tripropylene glycol is separated via the bottoms and crude propylene oxide is separated via the top in a distillation column;
   (ii) reacting the crude propylene oxide obtained in step (i) with water to give a mixture comprising monopropylene glycol, dipropylene glycol and tripropylene glycol;
   (iii) combining the propylene glycol mixtures obtained in steps (i) and (ii) and separating off the respective propylene glycols by distillation,

   wherein in (i), an aqueous hydrogen peroxide solution is used and wherein water is removed from the mixture obtained in (ii) prior to combination and separation in step (iii).

2. The process as claimed in claim 1, wherein the reaction of propylene with hydrogen peroxide in step (i) comprises at least the steps (α) to (γ):

   (α) reacting propylene with hydrogen peroxide to give a mixture comprising propylene oxide and unreacted hydrogen peroxide,
   (β) separating the unreacted hydrogen peroxide from the mixture resulting from step (α),
   (γ) reacting the hydrogen peroxide which has been separated off in stage (β) with propylene.

3. The process as claimed in claim 1 or 2, wherein propylene glycol is obtained as by-product in step (i) by reduction of 2-hydroperoxy-1-propanol and 1-hydroperoxy-2-propanol.

4. The process as claimed in any of claims 1 to 3, wherein, in step (ii), propylene oxide is reacted with water at a temperature of from 180 to 220 °C and a pressure of from 15 to 25 bar.

5. The process as claimed in any of claims 1 to 4, wherein the separation in step (iii) is carried out by distillation in a dividing wall column having two side offtakes and a column which is thermally coupled therewith, with monopropylene glycol being obtained from the upper side offtake of the dividing wall column, dipropylene glycol being obtained from the lower side offtake and tripropylene glycol being obtained from the column which is thermally coupled therewith.

6. The process as claimed in claim 5, wherein the distillation in the dividing wall column is carried out at a pressure of from 5 to 500 mbar and a temperature of from 50 to 200 °C.

7. The process as claimed in claim 5 or 6, wherein the distillation in the thermally coupled column is carried out at a pressure of from 5 to 500 mbar and a temperature of from 100 to 200 °C.

8. An apparatus for carrying out a continuous process for preparing propylene glycols according to any of claims 5 to 7, comprising at least one reactor for preparing propylene oxide, at least one reactor for reacting the propylene oxide with water to form propylene glycols, at least one dewatering apparatus for dewatering the water-containing propylene glycols and at least one dividing wall column having two side offtakes for separating off monopropylene glycol and dipropylene glycol and a column which is thermally coupled therewith for separating off the tripropylene glycol.

9. The apparatus as claimed in claim 8, wherein the at least one reactor for preparing propylene oxide consists of an isothermal fixed-bed reactor for

carrying out the step (α), an adiabatic fixed-bed reactor for carrying out the step (γ) and a separation apparatus for carrying out the step (β) as defined in claim 2.